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# Safeguarding SMEs dynamic capabilities in technology innovative SME-large company partnerships in South Africa

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## Abstract

This paper focuses on technological collaboration between small and large firms. It is argued that such collaborations can be beneficial for both types of partner, but that small firms often are confronted by the hazards of collaboration as these relationships are typically asymmetric. As a result of this, knowledge embodied in the dynamic (strategic, internal and external) capabilities of SMEs can flow unintentionally to the larger partner. If this occurs, the collaboration would be less successful from the SMEs' point of view. Next, it is proposed that the use of formal and informal safeguards can protect technology innovative SMEs against such knowledge flows. This paper examines to what extent is the number of dynamic capabilities of SMEs associated with partnership success and to what extent is this relationship influenced by the number of safeguards used by the SMEs? A sample of 43 technology innovative SMEs was interviewed by means of a structured questionnaire. Logistic regression analysis was conducted to determine the relationship between the number of dynamic capabilities on the one hand and partnership success on the other. Moreover, the impact of (in)formal safeguards on this relationship was analyzed. The research found that SME's strategic and internal capabilities are negatively associated with partnership success, whereas external capabilities are positively related. The inclusion of safeguards turned out to produce the hypothesized effects. The paper shows, therefore, that unintentional knowledge flows from the SME to the larger partner can be prevented by putting in place formal and informal protection mechanisms.

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**Keywords:** SME-large company partnerships; Inter-organizational relationships; Capabilities; Competencies; Safeguards; Opportunism; Knowledge spillover

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## 1. Introduction

This paper focuses on the cooperation occurring between technology innovating firms. The study, on which the paper is based, looks at technological collaboration between small and large firms. The discussion builds on theoretical arguments about control versus cooperation and the importance of networks for innovation. As the drivers of globalization and internationalization remove barriers that segmented the competitive environments of

small and large firms, more and more firms of all sizes are sharing the same competitive space. Collaborative arrangements are evolving through which smaller firms enter the value chains of larger firms (Etemad et al., 2001).

There is a growing body of literature dealing with the collaborative behavior of especially technology-intensive small firms. For example, Keeble et al. (1998) argued that these firms need to internationalize their activities, their sales in particular, because of the limited and global nature of the technological market niche in which they compete. Gomes-Casseres (1997) concluded that small firms often follow one of two collaborative strategies. When firms are small relative to their rivals and market, they tend to use alliances to gain economies of scale and scope. However, when they are large in relative terms, they avoid inter-organizational relationships. He maintained that this

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behavior is consistent with alliance usage by large firms. Although the number of collaborative efforts between small and large firms is growing, they often are problematic, as was observed by Hancké (1998). Based on a study of inter-organizational relationships between small and large firms in France, he concluded that, due to asymmetrical power relationships, it turned out to be very hard to construct trust-based networks between them. The studies mentioned above show that partnerships between small and large firms have both advantages and disadvantages.

Larger firms have a greater variety of options than small firms in terms of resources, capabilities and power, although their activities, too, are constrained by personal and institutional factors. Innovative small firms are generally characterized as being flexible and having the ability to respond faster to changing needs and environments. The increased importance of small firms in networks as leaders in technology has significant implications for industrial innovation. Technology-intensive small firms can be world-class in particular niches. As a consequence of their capabilities, small firms can establish inter-organizational collaborations with suppliers and selected competitors and can construct powerful networks. However, the ability of small firms to compete is constrained by conditions internal (e.g. lack of knowledge, skills, funds, people) and external to the firm (e.g. the market is dominated by a small number of major players or development of distribution channels is onerous). Inter-organizational collaboration for innovation is a way that small firms can overcome some of these bottlenecks.

Both for small and large firms, collaborative efforts can be advantageous. Lawton Smith et al. (1991) maintained that inter-firm collaboration can be beneficial to small firms because it provides, amongst others, the possibility of exploiting new technology; accessing new knowledge, expert users, new markets, and additional funds; and the possibility to improve management skills. From the perspective of the large firms, collaborating with small firms can be profitable too. For example, small firms have people with the right combination of specialized skills to develop new products and enable large firms to monitor the development of new technology and equipment.

When small firms offer specialist, unique competencies and abilities to large firms, collaborative arrangements are more likely to be equal, and small firms may be able to negotiate advantageous contracts with larger firms. Nevertheless, small firms are confronted by hazards of collaboration. Blomqvist et al. (2005, pp. 497–498) maintain that ‘collaborative R&D partnerships among asymmetric partners are becoming increasingly common, but given the asymmetry, the R&D context and the dynamic environment, there are inherent challenges. Small firms entering an asymmetric partnership often stake their reputation and future on the large partner’s integrity and willingness to find win-win solutions. Large companies may not have as much to lose, and they have better chances of avoiding

opportunism in that they have more resources for instituting legal actions, and they can refuse further transactions and find other partners instead’. Note that these authors define asymmetry not only in terms of different size, but also in terms of different power, management, *capabilities* and organizational cultures.

One of the most important reasons for low levels of success in innovative partnerships between small and large firms lies in the danger of unintended knowledge flows from the small to the large firm. Small companies have lost valuable competitive advantages to their partners through intentional and unintentional revelation of technological and commercial secrets. Competitive advantages of (small) innovative firms are grounded in so-called dynamic capabilities (Eisenhardt and Martin, 2000; Teece et al., 1997), which are distinctive processes (ways of coordinating and combining) shaped by the firm’s resource positions, such as the firm’s portfolio of knowledge and complementary assets. Especially in asymmetric relationships, the protection of these knowledge assets by informal (e.g. trust) and formal safeguards (e.g. contracting) is challenging (Hurmelinna et al., 2005). The above considerations lead to the research question of this paper: To what extent is the number of dynamic capabilities of SMEs (small and medium sized enterprises) negatively associated with perceived partnership success and to what extent is this relationship influenced by the number of safeguards that the SME ensures are in place?

Confirming empirically that with increasing numbers of dynamic capabilities the partnership success rate diminishes, but then confirming that formal and/or informal safeguards influence this relationship positively, would be very valuable insight for a technology innovative SME wishing to partner or already partnering with a large company. This would enable the SME to assess its readiness for the partnership, and ensure that the necessary safeguards were in place, that would lead ultimately to a successful partnership. As partnering with a large company in many cases forms part of the growth strategy of a technology innovative SME, improving the chances of a successful partnership is critically important to the growth and development of SMEs. As SME development is being viewed by governments as an engine of economic growth, successful growth of SMEs will enhance the competitiveness of a country. Improving the SME-large company interface is, therefore, an area of global economic importance, especially for countries, like South Africa, that are in the process of becoming more involved in the world economy and in processes of globalization and are at the same time battling poverty and unemployment. Related to this, Kaplinsky (2004) maintains that is not the question of whether to participate in these processes, but how to do so in a way that generates sustainable growth of income to poor people and countries.

The remainder of this paper is structured as follows. As this paper deals with innovative partnerships between large and small companies, a first question is whether innovative

partnerships are really problematic for South African SMEs. This question is answered in Section 2 and it will become clear that South African SMEs experience a variety of bottlenecks hampering their innovation processes. Despite these bottlenecks, innovative SMEs tend to engage in inter-organizational relationships with other organizations. Why that is the case is explained in Section 3. Especially, when SMEs have the capability to innovate and develop (technological) knowledge successfully, they become a potentially attractive partner for larger companies. These so-called dynamic capabilities are defined and discussed in Section 4. Dynamic capabilities embody knowledge possessed and developed by a firm. One of the important problems SMEs that are part of asymmetric partnerships have to deal with is the unintended flow of knowledge. Section 5 explains why such flows occur. The first five sections are helpful to formulate our hypotheses (Sections 6 and 7). The subsequent sections deal with methodological and measurement issues (Section 8) and the empirical results (Section 9). The paper ends with a concluding and discussion section.

## 2. Inter-organizational collaboration in South Africa: is it a problem for SMEs?

To contextualize this study, we first look at the size structure of the South African economy (see Table 1). It is clear from the Table that in terms of number of companies, the economy is dominated by small and medium sized firms. About 53% of all firms have less than 100 employees.

In terms of share of employment, however, large firms dominate: firms with 500 employees or more account for about 15% of the number of companies, but are responsible for almost 90% of the total formal employment in the country. A consequence of the South African size structure might be that there could be large levels of asymmetry if small firms collaborate with large companies.

A second relevant topic is to what extent there are differences between small and large firms as to their collaborative behavior. To answer this question, the database of the South African Innovation Survey 2001 (SAIS2001) was considered. In Table 2, the percentages of innovating firms with at least one innovative collaborative relationship, divided by size classes, are presented.

As compared to large firms, innovative small and medium sized South African firms show a far higher

Table 2

Percentages of innovative firms with at least one partnerships, by size class

Number of partnerships	<100 Employees (%)	100–<500 Employees (%)	500 Employees or more (%)
None	68.9	77.8	94.7
One or more	31.3	22.2	5.3

Source: South African Innovation Survey (2003).

Table 3

Factors hampering innovative activities of innovating SMEs (percentage of firms experiencing a innovation bottleneck)

Innovation bottleneck	All firms < 100 employees (%)	Firms < 100 employees with innovative partnerships (%)
Economic risks	61.5	54.5
Short of staff	62.7	87.5
Lack of knowledge	42.2	77.0
Costs too high	51.1	77.0
Short of finance	55.8	60.1
Time to market	46.7	44.4
Partnership	<b>22.5</b>	<b>38.6</b>
Demand risks	65.2	50.0
Regulations	38.7	39.8
Internal rigidities	26.3	40.0

Source: South African Innovation Survey 2001.

level of partnership activity, which is a second indication of the relevance of this study. However, having higher levels of partnership activity does not necessarily mean that these partnerships are regarded as problematic by innovative South African SMEs. In order to find out if, and to what extent, this is the case, again data from SAIS2001 are used. In SAIS2001, innovative firms were asked to indicate which factors hampered the innovative activities of firms. In Table 3, all firms with less than 100 employees are compared to firms with less than 100 employees that have at least one innovative partnership.

Two interesting results emerge from this data. Firstly, conducting innovation in South Africa turns out to be problematic for many SMEs. Especially, shortage of staff (lack of qualified personnel), demand risks (too many uncertainties on future product markets) and economic risks (cost–benefit analyses presented too many doubts) are hampering innovation projects. Secondly, more SMEs with innovative partnerships report partnership problems (co-operation with partners is not running smoothly) than the general population of SMEs with less than 100 employees: the percentage of this type of firms reporting these problems increases from 22.5% to 38.6%. These findings lead to the conclusion that: on the one hand, the problems which are encountered could be reasons to ally with a large organization, whereas on the other hand, innovative SMEs

Table 1

Size structure of the South African economy in 2003

Size class	Percentage of companies (%)	Percentage of employment (%)
100 Employees or less	52.8	2.4
100–500 Employees	31.7	7.8
500 Employees or more	15.5	89.8

Source: Statistics South Africa.

indeed do experience partnership problems, which is exactly the rationale for conducting this study.

### 3. Reasons for SME-large company partnerships

Dynamic capabilities and knowledge can be seen as critical resources for innovation. Takeuchi and Nonaka (2004) comment that a company whose sole business is continuous innovation can be classified as a “knowledge creating” company. Innovation is described by Freeman and Soete (1997) as comprising of two parts—recognition of a potential market for a new product or process, and technical knowledge that may be generally available, or may include new scientific and technological knowledge resulting from research. Referring to Pistorius’s definition of innovation, namely that innovation equals invention and market exploitation, and technological innovation encompasses idea generation, development, manufacturing and diffusion into the market (Pistorius, 1998), it is clear that dynamic capabilities and knowledge are building blocks for innovation. Not a single company has all the knowledge, competencies, expertise and resources to bring about innovations, accessing external sources to acquire these is necessary (Lam 1997; Oerlemans et al., 2001). Particularly in information and technology, and biotechnology industries, strategic alliances between SMEs and large companies are common (Harris, 2005; Shan et al., 1994). In the biotechnology industry the research and development expenditures are high, the commercialization cycles are long, and the regulatory procedures are long and complicated—but the potential pay-off is high. SMEs that may pose a threat by developing substitute products using new biotechnology techniques (and that struggle to get their products to market because of the reasons above) provide a partnership opportunity for large companies (Shan et al., 1994). Strategic alliances may, furthermore, be a way of scanning the environment looking for new opportunities. As such they allow companies to monitor markets before entering them (Hagedoorn and Sadowski, 1999). Another reason for partnerships is acquiring external knowledge resources (Laurie, 2001). From an SME perspective, partnering with a large company is a way to commercialize a high-tech product. Because SMEs have resource constraints, partnering with an LCO presents a way of accessing resources (management skills, distribution channels, marketing infrastructure, etc).

### 4. Dynamic capabilities: what are they?

The discussion on (dynamic) capabilities is theoretically grounded in the resource-based view (RBV) of the firm. The RBV is an influential theoretical approach for explaining how firms can build and maintain competitive advantage. The RBV proposes that firms can be seen as bundles of resources, which are heterogeneously distributed among firms, and that these differ-

ences persist over time. Firms can achieve sustainable competitive advantage if their resources are valuable, rare, inimitable, and nonsubstitutable (Eisenhardt and Martin, 2000).

Recently, RBV has been extended to dynamic markets (Teece et al., 1997), which are markets where the competitive landscape is shifting, especially due to technological development and innovation. To maintain competitive advantage, firms need so-called dynamic capabilities to ‘integrate, build, and reconfigure internal and external competencies to address rapidly changing environments’ (Teece et al., 1997, p. 516). The manipulation of knowledge resources, thus innovation and technology and innovation management, is especially of high importance in such markets (Kogut, 1996).

In the above, the concepts of resources, competences and capabilities have been coined, which need to be defined. Resources are firm-specific assets that are difficult if not impossible to imitate (Teece et al., 1997) or as Eisenhardt and Martin (2000, pp. 1106–1107) state physical, human and organizational assets that can be used to implement value-creating strategies. Examples are specialized equipment, skills, knowledge and expertise or superior sales force. Competences are resources that are assembled in clusters spanning individuals and groups so that they enable activities to be conducted. Teece and colleagues define dynamic capabilities as (1997, p. 516) “the firm’s ability to integrate, build and reconfigure internal and external competences to address changing environments”. Similarly, Eisenhardt and Martin (2000, p. 1107) propose that dynamic capabilities are “processes that use resources—specifically the processes to integrate, reconfigure, gain and release resources—to match and even create market change. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations” and “reflect an organization’s ability to achieve new and innovative forms of competitive advantage” (Teece et al., 1997, p. 516).

The concept of dynamic capabilities is a heterogeneous concept, i.e. a concept capturing different aspects as there are different types of capabilities. Eisenhardt and Martin (2000) distinguish a number of dynamic capabilities, by them labeled as routines:

- *Product development routines*, which relate to combining skills and functional backgrounds to create innovations.
- *Strategic decision making*: Pooling expertise to make decisions that shape the major strategic moves of an organization.
- *Transfer processes*: Routines to copy, transfer and recombine resources (especially knowledge) within the firm.
- *Resource allocation routines*: Distributing scarce resources (e.g. capital and manufacturing assets) from central point in the organization.



Table 4  
Key elements of dynamic capability

Strategic capabilities	
Search for market opportunities	
Understand and manage the fit between the firm's capabilities and market needs	
Internal capabilities	External capabilities
Manage tangible technology base	Access external knowledge
Products	Science
R&D facilities	Technology, techniques
Appropriate plant and equipment	Artifacts, practices
	Know-how, tacit knowledge
	Information sources
Develop and manage appropriate intangible resources	Manage network relations
Codified intellectual capital	
Qualification of skills and profile adapted to the need of the firm	
Tacit knowledge	
Create needed organization	Access partners with needed complementary assets
Technology management capabilities	Complementary knowledge
Change-management capabilities	Complementary production
Coordination among internal 'owners' of capabilities	Complementary supply-chain role of capabilities

Source: Adapted from Arnold and Thuriaux (1997, p.18).

- *Gaining/releasing resources*: Routines relating to knowledge creation and alliance and acquisition routines (networking) that bring new resources into the firm from external resources.
- *Exit routines*: Terminating the use of resource combinations that no longer provide competitive advantages to the firm.

Arnold and Thuriaux (1997) developed a framework of dynamic capabilities that basically contains the dimensions discerned by Eisenhardt and Martin. The framework (see Table 4) shows three kinds of capabilities: internal, external and strategic, which are interlinked and interdependent. The strategic capabilities (also known as 'adaptive capabilities'; see Wang and Ahmed, 2007) provides the mechanisms which enable the organization to manage its capabilities and exploit them in the market. Internal capabilities refer to the organization's ability to: (a) identify and manage its physical infrastructure in order to meet competitive requirements; (b) analyze its situation and put into place the needed skills; and (c) organize appropriately, and to implement change where and when necessary. The third group of capabilities is external and encompasses managing the relationship between the organization and the external resources which it needs.

We will use this framework in the empirical part of the paper as it reflects the discussion in the literature and because of its comprehensiveness and simplicity.

## 5. Unintended knowledge flows

Although, as has been described above, partnerships are necessary for innovation, many joint ventures and other strategic alliances fail (Park and Russo, 1996; Kogut, 1988; Porter, 1987). The high rate of failure of alliances is attributed to a lack of cooperation and the opportunistic behavior of partners (Das and Teng, 1998). Minshall et al. (2005) comment that in many instances the large firm is able to appropriate most of the value from the relationship and the general performance of the small firm may be adversely affected. Klosthen and Schaeferberg (2000) comment that an alliance between a very small and a large partner is unlikely to be successful long term as the small company may be acquired by the large one. Hence, it appears that a partnership between a technology innovative SME and a large company is unlikely to be successful. SMEs partnering with large companies are clearly at risk in terms of having the knowledge that is embedded in their capabilities appropriated by a large company. The appropriation concerns of the SME and the possibilities of opportunistic behavior by the large company are for a large extent caused by the characteristics of knowledge that is exchanged in R&D collaborations. Below, these features of knowledge are discussed.

Intentional transfer between two companies can happen when, for example, scientists divulge the results of their research or through R&D collaboration. Unintentional knowledge transfer, on the other hand, can occur when more knowledge is shared than was intended. Knowledge that is transferred unintentionally is largely tacit, i.e. highly contextual and difficult to codify, and happens through personal relationships where social bonds foster reciprocal trust (Breschi and Lissoni, 2001). The challenge when partnering is to share sufficient skills such that an advantage is created for the partners versus companies not part of the partnership, without transferring core skills to the partner. Companies must, therefore, develop safeguards against unintended transfers of information (Blomqvist et al., 2005; Hamel et al., 1989).

Unintentional knowledge spillover is a huge threat for an SME partnering with a large company. This is because should a large company might act opportunistically ("seeking self-interest with guile"—Williamson, 1975, p. 255) and profit from knowledge spillovers, an SME has little recourse as it lacks the resources to litigate against the large company. 'If the incentives are right a trustworthy (untrustworthy) person may be relied upon to be untrustworthy (trustworthy)' Dasgupta (1988, p. 54). Hence, it would appear that an SME having a high number of capabilities could be very vulnerable to a large company behaving opportunistically as the SME's capabilities can be appropriated by the large company with little fear of retribution.

Now, the question is: how is it possible that knowledge embodied in (dynamic) capabilities flows unintentionally from a SME to a large company? Such flows can occur due to some characteristics of knowledge, namely its levels of rivalry and excludability. Rivalry has to do with the extent to which the use of a good by one actor implies that a different

actor cannot use the same good anymore, whereas excludability refers to the extent to which it is possible to exclude actors not paying for use of a good. It is believed that the ‘good’ knowledge is characterized by low levels of rivalry and excludability, which basically means that an actor possessing or producing knowledge cannot fully appropriate its benefits (‘rents’). Hence, this knowledge can flow to other actors who profit from the efforts of the first actor (Atallah, 2002).

After discussing all relevant concepts, the stage is set for introducing and discussing the hypotheses, which will be empirically explored in this paper.

## 6. The relationships between SME’s dynamic capabilities and partnership success

Hence the first issue to be addressed is whether, in fact, the more dynamic capabilities an SME has, the less successful will be the partnership with a large company. The reasoning is that the more dynamic capabilities an SME has, the more vulnerable it will be to having these appropriated by a large company (see Cuganesan et al., 2006; Blomqvist et al., 2005, for empirical examples). Since dynamic capabilities are reflections of the knowledge SMEs have, one can argue that SMEs possessing richer bundles of dynamic capabilities have more difficulty monitoring and controlling them, which could lead, due to the specific characteristics of the commodity knowledge, to an unintended flow to the larger partner in the collaboration. As a result, the SME would regard the collaboration as less or even unsuccessful. Hence, our first set of hypotheses reads:

- H<sub>1a</sub>: Higher numbers of strategic capabilities possessed by SMEs are associated with lower levels of perceived partnership success.
- H<sub>1b</sub>: Higher numbers of internal capabilities possessed by SMEs are associated with lower levels of perceived partnership success.

Several authors (Draulans et al., 2003; Ireland et al., 2002; Gnyawali and Madhavan, 2001) argue that inter-organizational relationships and networks have to be effectively managed to realize their benefits. Empirical research (Rothaermel and Deeds, 2006; Deyer et al., 2001) has shown that firms that systematically manage their inter-organizational relationships are able to create more value. Therefore, we propose the following hypothesis:

- H<sub>1c</sub>: Higher numbers of external capabilities possessed by SMEs are associated with higher levels of perceived partnership success.

## 7. Protecting SMEs against (un)intended knowledge flows: the effects of safeguarding mechanisms

As stated by Hamel et al. (1989) and Blomqvist et al. (2005), there is a need to put in place safeguards to reduce

the possibility of unintended knowledge flows—and this is especially important for an SME. From a theoretical perspective, this need for safeguards can be grounded in the transaction cost approach. The basic argument of transaction cost theory as applied to inter-organizational collaboration builds on Alchian and Demsetz (1972) discussion of team production and focuses on appropriation concerns that stem from the presence of behavioral uncertainty, in combination with the problematic nature of specifying the property rights of new knowledge created and by the challenges of monitoring and enforcing contracts. Applied to a context of collaboration, appropriation concerns refer to “the firm’s concern about its ability to capture a fair share of the rents from the alliance in which it is engaged. Such concerns arise from the uncertainties associated with future specifications, cost uncertainties, and problems in observing partner’s contributions, all of which aggravate the potential for moral hazards” (Gulati and Singh, 1998, p. 788). These problems are even worse in collaborations in which technological knowledge is included. As was explained in a previous section, this is due to the specific characteristics of knowledge. After all, in such cases it can be even more difficult to circumscribe, bound, monitor, and codify the knowledge that is included in the collaboration, possibly leading to free-riding behavior and possible appropriation of (key) technology by the partner.

The literature has recognized these appropriation concerns (Dekker, 2004) and proposed a number of so-called governance or safeguarding mechanisms (Blomqvist et al., 2005; Jeffries and Reed, 2000), which enables parties in collaborations to protect their interests. Ouchi (1979) describes three control mechanisms, namely a market mechanism, a bureaucratic mechanism (hierarchical governance), and an informal social mechanism (network or clan governance). The market mechanism is where a fair price is determined by competitive bids and a competitive process; the bureaucratic mechanism is where control is exercised by rules, personal surveillance and direction of subordinates by superiors; and social mechanisms are where similar values, beliefs and cultures control behavior. Hierarchical control elements can include standard operating procedures, the command structure, the authority systems including planning, rules, programs or procedures for task coordination (Gulati and Singh, 1998). A more refined classification is proposed by Dekker (2004) and is presented below (see Table 5).

Basically, Dekker distinguishes formal and informal control or safeguarding mechanisms. Formal safeguards refer to organizational devices aiming at controlling conditions and outcomes of collaboration, that is, mechanisms that specify conditions of the collaboration and the outcomes to be accomplished in the relationship, and by its partners and monitor the realization of these outcome targets. Behavioral safeguards specify how collaboration partners should act and monitor whether actual behaviors are in line with pre-specified behaviors. Social or informal

Table 5

Dekker's formal and informal control mechanisms in inter-organizational relationships

Formal control		Informal control
Outcome control	Behavior control	Social control
<i>Ex ante mechanisms</i>		
Goal setting	Structural specifications	Partner selection
Incentive systems	Planning	Trust (goodwill/capability)
Reward structures	Procedures	Interaction
	Rules and regulations	Reputation
		Social networks
<i>Ex post mechanisms</i>		
Performance monitoring and rewarding	Behavior monitoring and rewarding	Trust building
		Risk taking
		Joint decision making and problem solving
		Partner development

Dekker (2004).

control mechanisms are based largely on trust, where Boon and Holmes (1991, p. 194) describe trust as “positive expectations about another’s motives with respect to oneself in situations entailing risk”. Hart and Saunders (1997, p. 30) comment that “trust mitigates the extent of the uncertainty that exists between organizations which cannot control one another’s actions...it discourages opportunistic behavior which would clearly reduce the opportunity for greater information sharing over time”.

As was argued at the beginning of this section, SMEs that collaborate with large firms are confronted with appropriation concerns and possible forms of opportunistic behavior, especially when technology is a component in the relationship. Hence, the second issue to be addressed is to what extent can SMEs protect themselves against opportunistic behavior when partnering with a large company? We propose that this protection can be realized if SMEs put in place formal and informal safeguards that enable them to pre-specify outcomes of the collaboration and to monitor the behavior of the partner. In other words, we argue that formal and informal safeguards influence the relationship between dynamic capabilities (strategic, internal and external) and perceived partnership success. More specifically, we contend that more safeguarding by the SME will strengthen the empirical relationship between the variables mentioned in Hypothesis 1. Therefore, the second set of hypotheses reads:

H<sub>2a</sub>: The greater the number of total safeguards that are in place, the stronger will be the relationship between the number of dynamic capabilities and the perceived success of the partnership.

H<sub>2b</sub>: The greater the number of informal safeguards that are in place, the stronger will be the relationship

between the number of dynamic capabilities, and the perceived success of the partnership.

H<sub>2c</sub>: The greater the number of formal safeguards that are in place, the stronger will be the relationship between the number of dynamic capabilities, and the perceived success of the partnership.

## 8. Methods and measurements

An empirical study was conducted and the data was collected by means of a structured questionnaire. Binary logistic regression was performed on the data in order to determine how well the respective models fitted the observed data. The results enable us to test our hypotheses empirically.

A questionnaire was constructed to capture the perspectives of SMEs. Questions were designed to capture a response pertaining to the different aspects of dynamic capabilities and formal and informal safeguards. The responses on items measured in each case using a 2-point scale: 1 = yes; 0 = no. The independent variables were categorized as the number of strategic, internal and external capabilities, and the variables the number of formal and informal safeguards used by an SME. For the latter two variables, it is hypothesized that they influence the relationship between capabilities and perceived partnership success, which are so-called moderating effects.

The first independent variable relates to the number of strategic capabilities possessed by an SME. In a previous section, strategic capabilities were defined as processes that enable a firm to search for market opportunities and to understand and manage the fit between the firm’s capabilities and market needs. To capture these capabilities a number of questions were asked to the participating firms that reflect whether an SME has the ability and knowledge to deal with these strategic issues. Items included are the ability to get access to new markets and market segments; to create a entry barrier; not to miss a trend; spreading risks; to recognize the innovative characteristics of the environment; and see the need to improve management skills, ease pressures from investors, obtain financial support or look for new challenges for the organizations. Typical questions asked were for example: “What was the main reason for your company to partner with the large company?”. Possible answers were ‘gaining access to new markets or larger share of current market’ or ‘optimizing entrepreneurship value’, which are issues of strategic importance to an organization. To compute the variable number of strategic capabilities, a compound variable was constructed by summing up the dichotomized items. Higher values of this variable indicate higher number of strategic capabilities.

Our second independent variable is the number of internal capabilities of the SME, which are defined as the ability to manage the tangible technology base of the company, to develop and manage intangible resources, and to create the needed organization. A number of questions



were asked to SMEs covering these dimensions: whether or not a large firm wanted to partner with the SME because of its brand, product or assets. If so, the SME has shown that it is able to manage its tangible resource base. In a similar way, the SMEs' ability to develop and manage intangible resources was measured. Items included were for example whether or not the SME had developed intellectual propriety knowledge, whether it had been granted patents or whether the company was regarded as an important player in the field in terms of its technological expertise. Management of change capabilities of the SME were indicated by the recognition of its managerial expertise and its ability to manage innovation. A compound variable ('number of internal capabilities') was computed applying the same procedure as was described in the previous paragraph.

The third and last independent variable is the number of external capabilities, which was defined as the ability to get access to external knowledge and to partners with complementary assets, and the ability to manage inter-organizational relationships. Questions asked to the SMEs pertained to whether or not the company cooperated with a large organization (e.g. through a joint venture or a technology development sub-contract), whether the offering of the SME was complementary to the large organization in terms of technologies, distribution or assembly, or whether the SME was a recognized and experienced networker (reflecting its ability to manage network relations). To compute the variable number of external capabilities, a compound variable was constructed by summing up the dichotomized items. Higher values of this variable indicate higher number of external capabilities.

The number of formal safeguards put in place by the SME included: the partnership between the SME and the large company was formalized; quantitative measures were used for determining whether the partnership was successful; the large company had a technology strategy; the expansionist opportunities the SME presented to the large company; the means by which the large company gathered information on the SME; the existence in the SME of a documented process for monitoring quality and reliability of products; and that a substantial equity stake of the SME was held by another entity. The informal safeguards included: the level of trust by the SME in the large company prior to the partnership; the level of trust by the SME in the large company after the partnership; classification of the large company as being opportunistic; cultural fit, namely: the large company being a South African company, and the main core values to which the large company ascribed; the SME being the project champion; the reputation of the SME; the main reason for the SME to partner with the large company; the approximate cost for the large company to switch to/acquire the SME's technology; the joint decision making process used in managing the partnership; and the position of the SME in its industrial cluster. Two compound variables were computed applying the same procedure as was described

in the previous paragraphs: (1) the number of formal safeguards put in place by the SME, and (2) the number of informal safeguards put in place by the SME. Moreover, a third variable was created reflecting the total number of safeguards used by the SME in the relationship.

One hundred and eighty South African technology innovative SMEs were approached and 43 responded, giving a response rate of 23.9%. Of these 91% were from the Gauteng Province (Gauteng Province being the largest contributor to South Africa's gross domestic product) and most of these Gauteng companies (59%) were based in Pretoria. Most participating firms (55%) are active in ICT product development (e.g. warehouse management systems, embedded software or internet use authentication software). About 32% are firms that develop and manufacture new or improved products, such as electronic devices or special chemical for the mining industry. A small proportion (11%) of firms is active in the field of engineering and innovation management.

## 9. Results

Table 6 lists the results of the binary logistic regression analyses. Thereafter, a discussion is presented in terms of how the results relate to the various models and their associated hypotheses. The analyses were performed in a number of steps. First, the association between strategic, internal and external capabilities as independent variables and perceived partnership success as the dependent variable was determined [Model 1]. Next, three additional models were estimated taking the effects of safeguards into account: (1) the total number of safeguards [Model 2]; (2) the number of informal safeguards [Model 3]; and (3) the number of formal safeguards [Model 4].

It turns out that all models are statistically significant, as is shown by the Omnibus test. Nagelkerke  $R^2$ , which gives an indication of the percentage of variance explained, ranges from 20.3% for Model 1 to 41.9% for Model 2.

### 9.1. Model 1: the relationships between strategic, internal, and external capabilities and perceived partnership success

Model 1 examined empirically the relationship between the number of strategic, internal and external capabilities and perceived partnership success. From the results captured in Table 6, both the number of strategic and external capabilities are statistically significant. The *expected B* (coefficient) of the number of strategic capabilities is less than 1 (0.766), which signals a negative relationship between the number of strategic capabilities and perceived partnership success. This means that the more strategic capabilities SMEs have, the lower their perceived partnership success. It seems that strategic knowledge possessed, acquired or developed by SMEs on market opportunities and market positioning flows to the larger collaborative partner. When this occurs, the SME perceives the collaborative arrangement as unsuccessful (see also Judge

Table 6

Binary logistic regression analyses with partnership success as the dependent variable and the factors influencing partnership success as the independent variables

Independent variables	Model 1	Model 2	Model 3	Model 4
Nagelkerke $R^2$ (%)	20.3	41.9	27.7	28.4
Percent correct cases overall (%)	67.4	72.1	65.1	74.4
Percent correct cases unsuccessful (%)	47.1	64.7	52.9	58.8
Percent correct cases successful (%)	80.8	76.9	73.1	84.6
Omnibus test	6.968 (0.073)	15.948 (0.014)	9.839 (0.043)	10.114 (0.039)
Exp $B$ coefficients				
Strategic capabilities	0.766 (0.095)	0.164 (0.081)	0.704 (0.046)	0.435 (0.029)
Internal capabilities	0.795 (n.s.)	0.593 (0.092)	0.755 (n.s.)	0.711 (n.s.)
External capabilities	1.394 (0.080)	0.271 (n.s.)	0.905 (n.s.)	1.335 (n.s.)
Interaction of total safeguards and strategic capabilities		1.058 (n.s.)		
Interaction of total safeguards and internal capabilities		0.901 (0.062)		
Interaction effect of total safeguards and external capabilities		1.064 (0.097)		
Interaction of strategic capabilities and informal safeguards			0.030 (n.s.)	
Interaction of internal capabilities and informal safeguards			2.026 (n.s.)	
Interaction of external and informal safeguards			1.024 (0.091)	
Interaction of strategic capabilities and formal safeguards				1.045 (0.087)
Interaction of awareness capabilities and formal safeguards				1.188 (n.s.)
Interaction of external capabilities and formal safeguards				0.047 (n.s.)

Levels of significance in parenthesis.

and Dooley, 2006). From this result, it can be concluded that Hypothesis 1a is confirmed.

As second finding is that the higher the number of external capabilities is, the higher the probability that the SME values the collaboration as successful ( $\text{Exp}(B) > 1$ ). This finding corroborates results reported by Kale et al. (2002) and Heimeriks and Duysters (2007), implying that when SMEs have the ability to access and manage external knowledge and external complementary assets, this will increase the likelihood of partnership success. In sum, having external or network capabilities has a positive effect on collaboration outcomes, which confirms  $H_{1c}$ .

As the number of internal capabilities was not included in the equation as this variable was not statistically significant, sub-hypothesis  $H_{1b}$  was rejected.

## 9.2. Model 2: the relationships between strategic, internal and external capabilities and perceived partnership success influenced by the total number of safeguards

However, the introduction of the total number of safeguards put in place by SMEs changes the relationship between the different types of dynamic capabilities distinguished and perceived partnership success. Firstly, the  $\text{Exp}(B)$  value of the number of strategic capabilities becomes more negative (as compared to Model 1), whereas the interaction effect of the total number of safeguards (both formal and informal) has the expected positive sign, but is, however, not statistically significant. In other words, the combination of formal and informal safeguards cannot prevent that knowledge embodied in the strategic capabilities of SMEs flowing to the larger partner in the cooperation, which, as a result, lowers the probability of

partnership success (see the results of Model 4 for a further specification of this result).

Secondly, higher numbers of internal capabilities are negatively associated with perceived partnership success. Again, it turns out that higher capability levels are, without the protection provided by safeguards, related to lower probabilities of perceived partnership success. However, the more formal and informal safeguards SMEs put in place, the less negative the relationship between the number of internal capabilities and partnership success is. This means that SMEs can better protect their tangible technology base and intangible resources, thus their internal capabilities, if more formal and informal safeguards are used.

A third result is that the interaction effect of external capabilities and the total number of safeguards has an  $\text{Exp}(B)$  value larger than one. This positive effect means that a higher number of formal and informal safeguards used by the SME strengthens the relationship between external capabilities and perceived partnership success.

In sum, the results of Model 2 show that Hypothesis 2a is accepted for internal and external capabilities, but not for the number of strategic capabilities.

## 9.3. Model 3: the relationships between strategic, internal and external capabilities and perceived partnership success influenced by the number of informal safeguards

Model 3 empirically explores the relationships between strategic, internal and external capabilities and perceived partnership success, now influenced by the number of informal safeguards put in place by SMEs. As can be seen in Table 6, again the number of strategic capabilities has

the expected negative sign: a higher number of strategic capabilities are associated with a lower probability of partnership success. The other two variables measuring dimensions of dynamic capabilities turn out to be not statistically significant. Interestingly, the interaction effect of external capabilities and informal safeguards is significant with a positive sign ( $\text{Exp}(B)\text{-value} > 1$ ). This means that the relationship between external capabilities and perceived partnership success is strengthened if influenced by a higher number of informal safeguards. As informal safeguards are largely based on trust, this empirical result shows that networking and trust are close companions. Informal safeguards function as lubricants that ease networking because they enhance the acceptance of uncertainty (Arrow, 1974), increase predictability and permit greater flexibility (Luhman, 1979). As such, this empirical finding is similar to what was found by other scholars (see for example Krishnan et al., 2006; Lui et al., 2006; Gulati and Singh, 1998). The two other interaction variables in this model were not statistically significant.

#### *9.4. Model 4: the relationships between strategic, internal and external capabilities and perceived partnership success influenced by the number of formal safeguards*

In Model 4, the relationships between strategic, internal and external capabilities and perceived partnership success are explored, now influenced by the number of formal safeguards used by SMEs. If we compare the results of this model with the previous ones, an interesting result emerges. Again it is found that a higher number of strategic capabilities is associated with a lower probability of partnership success as perceived by the SMEs in our sample. The combined (interaction) effect of the number of strategic capabilities and formal safeguards is statistically significant with a positive sign ( $\text{Exp}(B)\text{-value} > 1$ ). By implication, these findings show that if SMEs are able to protect the knowledge embedded in their strategic capabilities with formal safeguards, this will increase the likelihood of partnership success. In other words, putting in place organizational mechanisms that formalize the inter-organizational relationship with the large company, enable clear specification of collaborative outcomes and monitoring the behavior of the partner, helps to protect the unintended flow of strategic knowledge, which results in more successful collaboration. In sum, protecting strategic knowledge needs formal safeguarding. Similar results were reported by Hurmelinna et al. (2005).

## **10. Discussion and conclusions**

This study examined the effects of formal and informal safeguarding on the relationship between dynamic capabilities and perceived partnership success. The partnerships under investigation are collaborations on innovation between small and large organizations, which are also known as asymmetric collaboration. The size of the sample

was small and geographically skewed, hence the findings should be seen in the light of indicating trends rather than conclusive findings that would apply to and be representative of a larger population. Despite the small sample size, some interesting findings emerged from the analyses.

Firstly, it was hypothesized that strategic and internal capabilities of SMEs would be negatively associated with perceived partnership success. As capabilities embody the knowledge of the SME and due to the characteristics of knowledge, it was argued that it is possible that part of this knowledge flows unintentionally to the larger company in the collaboration. As a result, SMEs would qualify the collaboration as unsuccessful. These effects were indeed empirically observed, especially for strategic capabilities (confirming Hypothesis 1a) and to a lesser extent for internal capabilities (partly confirming Hypothesis 1b). That strategic capabilities are negatively related to partnership success in all models shows that these capabilities capture the very core (market) knowledge of the SME. That is, knowledge about the alignment between the firm's resources and its environment (e.g. trends among and needs of users), which is vital for business success (Newbert, 2007). If this knowledge flows unintentionally to the larger partner in the cooperation, this would seriously damage the market position of the smaller firm.

Secondly, it was hypothesized and empirically confirmed that external or network capabilities were positively related to perceived partnership success. This result corroborates the findings of research on so-called alliance capabilities. Organizations, in our case SMEs, that have more experience with inter-organizational collaboration or have the ability to manage their network are more successful, both in terms of their own performance (Draulans et al., 2003) and in terms of building and maintaining inter-organizational relationships, as is shown in this study.

The inclusion of safeguards in our models turned out to produce the hypothesized effects. In other words, safeguards strengthened the relationship between dynamic capabilities and perceived partnership success, thus having a so-called moderating effect. However, effects varied considerably depending on the type of dynamic capability. Formal and informal safeguards combined, which is our variable 'total safeguards', seem to prevent the unintentional flow of knowledge embodied in internal and external capabilities to the larger partner. Moreover, there is a positive impact of the combination of external capabilities and informal safeguards, which emphasizes the importance of trust, goodwill, and interaction, thus of social control, in inter-organizational relationships and networks (Klein Woolthuis et al., 2005) as important factors for partnership success. Lastly, the combination of strategic capabilities and formal safeguards turned out to be of importance. This finding shows that strategic capabilities can be protected by a specific type of safeguards, which encompass procedures, rules and regulations and intensive monitoring. As was explained in the above, strategic capabilities refer to knowledge of vital importance to firms. Our results show

that for its protection this knowledge needs special, formalized ex ante and ex post measures.

To conclude, this paper has shown that knowledge embedded in capabilities can impact on the success of partnerships. Moreover, it has shown that these unintentional flows can be prevented by putting in place formal and informal safeguards. However, not every safeguard will have the effect sought-after, as this depends on the type of capability an organization wants to protect.

These results could be valuable information to managers of SMEs for two reasons. First, as a reminder for possibility of knowledge spillovers. Second, as our findings show that a differentiated approach is needed for the protection of different types of capabilities.

Future research could include the following: testing which of the individual items comprising the compounded variables are the most influential; determining whether the items selected as dynamic capabilities are the most appropriate, or whether there are others that should be tested; revisiting the composition of formal, as well as informal safeguards and testing the appropriateness and effect of the items selected on partnership success; testing the research findings with a representative sample of SMEs to establish the congruence of the findings with the considered opinion of the affected population—possibly a case study approach; repeating the research in a couple of years time to determine the effect of a changing South African environment; testing the views of both an SME and a large company perspective; and finally, improving the external validity of the research by testing a larger, more representative sample, both geographically and from different high-tech sectors.

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